

**Listing of Claims:**

1. (Currently Amended) An optical DNA sensor comprising:
  - a solid imaging device which is configured to have a plurality of types of DNA probes each including a different nucleotide sequence arrayed and fixed on a surface of the solid imaging device;
  - a plurality of photoelectric elements provided in the solid imaging device; and
  - ~~a transparent conductive layer which is provided in the solid imaging device between the DNA probes and the plurality of photoelectric elements, and to which a voltage is applied to attract a nucleotide strand~~
  - an exciting light absorbing layer provided between the DNA probes and the photoelectric elements to absorb exciting light; and
  - a conductive layer which discharges charges caused by electron-hole pairs generated by the absorbed exciting light in the exciting light absorbing layer.

Claims 2 and 3 (Canceled).

4. (Previously Presented) The optical DNA sensor as claimed in claim 1, wherein each of the photoelectric elements comprises a field effect transistor which has a semiconductor layer that generates electric charges by receiving light.

5. (Currently Amended) An optical DNA sensor comprising:  
a solid imaging device,  
an exciting light absorbing layer which absorbs exciting  
light, and which is formed on a surface of the solid imaging  
device, and which is configured to have a plurality of types of  
DNA probes each including a different nucleotide sequence aligned  
and fixed on the exciting light absorbing layer,  
a plurality of photoelectric elements provided in the solid  
imaging device, and  
10 ~~a transparent conductive layer which is provided in the  
solid imaging device between the DNA probes and the plurality of  
photoelectric elements, and to which a voltage is applied to  
attract a nucleotide strand~~  
~~a conductive layer which discharges charges caused by  
15 electron-hole pairs generated by the absorbed exciting light in  
the exciting light absorbing layer.~~

Claims 6-7 (Canceled).

8. (Currently Amended) An optical DNA sensor comprising:  
a solid imaging device having a transparent substrate;  
a plurality of photoelectric elements which are arranged  
apart from each other on a surface of the transparent substrate

5 and each of which includes include a bottom gate electrode having  
a shading property, a semiconductor layer having a light  
sensitivity, and a light-transmissive top gate electrode, wherein  
the bottom gate electrode, the semiconductor layer and the light-  
transmissive top gate electrode are layered in order on the  
10 transparent substrate;

means for applying negative voltage to the light-  
transmissive top gate electrode in a charge storage period;

a light-transmissive protective layer which coats the  
plurality of photoelectric elements, and which is configured to  
15 have a plurality of types of DNA probes each including a  
different nucleotide sequence aligned and fixed thereon; and

a transparent conductive layer which is provided in the  
solid imaging device between the DNA probes and the plurality of  
photoelectric elements; [ , ] and to which a voltage is applied  
20 to attract a nucleotide strand

means for applying one of a positive voltage and a ground  
potential to the transparent conductive layer.

Claim 9 (Canceled).

10. (Currently Amended) A DNA reading apparatus comprising:

(i) an optical DNA sensor which comprises:

a solid imaging device having a transparent substrate;

a plurality of photoelectric elements which are  
5 arranged apart from each other on a surface of the transparent  
substrate and each of which ~~include~~ includes a bottom gate  
electrode having a shading property, a semiconductor layer having  
a light sensitivity, and a light-transmissive top gate electrode,  
wherein the bottom gate electrode, the semiconductor layer and  
10 the light-transmissive top gate electrode are layered in order on  
the transparent substrate;

means for applying negative voltage to the light-  
transmissive top gate electrode in a charge storage period;

a light-transmissive protective layer which coats the  
15 plurality of photoelectric elements, and which is configured to  
have a plurality of types of DNA probes each including a  
different nucleotide sequence aligned and fixed thereon; and

a transparent conductive layer which is provided in the  
solid imaging device between the DNA probes and the plurality of  
20 photoelectric elements; ~~[,]~~ and ~~to which a voltage is applied~~  
~~to attract a nucleotide strand~~

means for applying one of a positive voltage and a  
ground potential to the transparent conductive layer; and

(ii) a light irradiation member which irradiates phosphor  
25 exciting light toward a rear surface of the transparent substrate  
of the solid imaging device.

11. (Original) A DNA reading apparatus as claimed in claim 10, wherein the light irradiation member is disposed below the optical DNA sensor.

12. (Previously Presented) A DNA reading apparatus as claimed in claim 11, wherein the light irradiation member irradiates the phosphor exciting light to the DNA probes through the solid imaging device.

13. (Previously Presented) A DNA reading apparatus as claimed in claim 11, wherein the light irradiation member irradiates both the plurality of types of DNA probes and the solid imaging device, and the phosphor exciting light irradiated by the light irradiation member has a wavelength in a range which excites a fluorescent substance that labels a sample DNA bondable to an appropriate one of the DNA probes but does not sufficiently excite the solid imaging device.  
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Claims 14-16 (Canceled).

17. (Previously Presented) A DNA reading apparatus as claimed in claim 12, wherein the light irradiation member irradiates both the plurality of types of DNA probes and the solid imaging device, and the phosphor exciting light irradiated

5 by the light irradiation member has a wavelength in a range which excites a fluorescent substance that labels a sample DNA bondable to an appropriate one of the DNA probes but does not sufficiently excite the solid imaging device.

18. (New) The optical DNA sensor as claimed in claim 4, wherein the semiconductor layer of the field effect transistor has light sensitivity, and wherein the field effect transistor also has a bottom gate electrode and a light-transmissive top 5 gate electrode.

19. (New) The optical DNA sensor as claimed in claim 18, wherein a negative voltage is applied to the light-transmissive top gate electrode.

20. (New) The optical DNA sensor as claimed in claim 1, wherein one of a positive voltage and a ground potential is applied to the conductive layer.

21. (New) The optical DNA sensor as claimed in claim 1, further comprising a protective insulated layer between the conductive layer and the plurality of photoelectric elements.